Climate Baseline Assessment Report
Boulder, Colorado
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City of Boulder Staff Interviewed

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Description Of Public Commitments To An 80X50 Or Equivalent Target

- "Boulder's Climate Commitment" is the city's integrated planning initiative to reduce greenhouse gas (GHG) emissions from both city operations and in the community at large. Council has asked for an analysis to support an 80x50 goal and is expected to approve it in November 2014.
- This initiative, which builds on the Climate Action plan developed initially in 2004 and updated in 2006, 2009 and 2010, integrates climate action elements into all departmental master plans. Rather than develop a separate plan, the Council committed to an overarching framework and to integrate climate elements into the master plans for water, waste, transportation, etc.
- In July 2013, council provided preliminary direction to significantly formulate a strategy to achieve 80 percent GHG reductions below 1990 levels by 2050 or sooner. The project is also aiming to define new tracking and reporting systems to allow for transparency, consistency in reporting, shared learning and continual improvement in Boulder's climate-related programs and policies.
- A multi-departmental staff team has been working with consultants to identify new strategies and program options to enable the city and community to set a course to achieve long-term goals by formulating interim targets, based on a timeframe similar to the IC4N framework—Immediate (2014);l Near-term (2015-2020);Mid-term (2021—2035); Long term (2036-2050. Community Planning and Sustainability staff are preparing scenarios for achieving the 80x50 goal, including specific timeframes, actions, and contribution to emissions reductions.
- A City Council briefing session in the spring of 2014 will discuss issues associated with the long-term 80x50 reduction goal and for reviewing proposed interim targets, strategies, and emissions reductions (to be coordinated with Transportation Master Plan strategies and energy action goals).
- Staff will continue conducting strategy identification and analysis through June of this year in preparation for a major study session with Council 7/29. At this session staff will present a draft climate action strategy for review including refinements on the original goal and targets presented in the 7/30/13 study session with Council. Based on Council feedback, staff will

refine the strategy and prepare for extensive community outreach and discussion of the draft strategic framework, goals and targets, and specific strategies in high-leverage areas. This input will be integrated into a final draft strategy, which will be presented for Council consideration and approval in November of 2014.

- Analysis to date suggests that conservation and energy efficiency measures are likely to contribute between 20-30% of GHG reduction objectives. This includes both the existing efforts associated with residential and commercial energy efficiency and additional efforts being contemplated. The remainder coming from a transition to carbon free energy sources. Boulder's largest emissions are from electricity because it is tied to a regional generation system that is coal based. This is why a key strategy for Boulder is positioning itself to significantly change its energy source by creating its own municipal utility. Transportation is the other major GHG emissions reduction priority, with strategies that focus both on reduction of transportation vehicle miles travelled (VMT) and strategies to substitute low-carbon energy alternatives (electricity, fuel cells etc).

- Appendix I. shows current thinking about **Roadmaps by Key Sector.**

Relationship Between the 2050 Goals and Short Term Goals

- The City Council asked for a new goal to replace the Kyoto Protocol goal. Community Planning and Sustainability staff researched NAS, IPCC, and President's Task Force on Climate Change, and then offered an 80x30 goal. The Council provisionally chose an 80x50 goal until a final vote in November 2014.

- The Council also decided that the Climate Commitment would be an iterative and dynamic process (a strategy), rather than a stand-alone plan. It will establish interim targets through 2050, which will be revisited based on modeling and new information to achieve the community's near- and long-term GHG reduction goals. The strategy also has an explicit focus on climate action as an economic development strategy, integration of mitigation and adaptation, and a strategy for local, state and national policy reform that opens the way for other communities to take a similar transition pathway.

- The primary focus for the first plan is the three major areas of GHG emissions: buildings, transportation, and renewable energy development. While efforts are currently underway in other key areas--waste, green infrastructure and water (Waste Not, Grow Green and Every Drop), as well as climate adaption--they are not high-leverage areas of focus for the climate commitment work at this time.

The mid-term and long-term targets for Boulder are closely intertwined. Planning and

Sustainability staff says that a mistake in early climate plans was a focus on intangible reductions in GHG emissions. The new approach will be to engage and inspire the community to make a massive shift to renewable energy. The 80x50 goal basically calls for an orderly and rapid transition off of fossil fuels. The entire community will be engaged in how to shift 400-500MW of energy and redeploy $350 million spent on energy resources annually to local economic development. This could include, for example, programs that help them to buy EVs and put solar panels on their roofs. See The Solutions Project coordinated by Mark Jacobson at Stanford University.

- Relationship to Carbon Neutrality: Council had discussion in late 2012 about the possibility of a carbon neutrality goal. The Council asked for specific strategies that would accomplish carbon neutrality. Because of concerns within the Council about the realities of achieving carbon neutral (particularly within the political realities of a contentious community discussion focused on municipalization of the electric utility), staff came back with an 80x50 goal. Boulder has begun to utilize the Carbon Neutral Communities Project framework prepared by IN4C as a way of framing the road to carbon neutrality. Boulder has condensed the four energy related focus areas of the IN4C framework—Commercial and Residential Buildings; Electricity; Industry and Transportation—into three categories: energy efficiency (residential, commercial and industrial), energy source (electricity & natural gas) and transportation (which includes elements of energy source replacement).

Political and Civic Leadership Support for Deep Carbon Reductions

- The City of Boulder has a long-standing commitment to climate action supported by the community.
- Boulder's City Council formally adopted the 1997 Kyoto Protocol targets of 7% reduction in GHG emissions below 1990 levels by 2012 in 2002 in what is known as "Resolution 906".
- Boulder voters approved the first locally-based "carbon tax" to help fund these activities in 2006.
- After several years of operating a conventional energy efficiency program, and not being able to achieve a high level of penetration or audit-to-action, the city formed community-based technical consultation working groups that resulted in the development and piloting of a new 'energy advisor' model and program delivery that includes quick-installs during initial audits, extensive follow up, and contractor training and pre-approval. Rebranded"Energy Smart" for homes and businesses, and supported by a "Better Building" grant award from DOE starting in 2010, as part of the ARRA funding programs, the program is now delivering efficiency services to thousands of homes and businesses each year, and achieving audit-to-action ratios of over 75% in the residential sector and over 50% in businesses. These services are delivered countywide in coordination with Boulder County, other cities and private sector partners.
- Boulder launched the nation's first residential rental property energy efficiency requirement in 2011 Rental units represent approx 50% of Boulder's housing stock. (SmartRegs) This program requires every licensed rental property meet basic efficiency standards by 2018.

- The analysis of energy efficiency and conservation efforts demonstrated the necessity of changing the city's energy source to achieve community GHG reduction goals. This analysis informed the city's negotiations with Xcel Energy to develop new terms of service with a much larger commitment to renewable energy development as part of the soon-to-expire franchise agreement.
- When these talks resulted in no firm commitments, the City Council voted to not renew the franchise agreement and instead to request community approval and approval of funding measures to actively explore exercising its Home Rule authorities to take control of the utility infrastructure that serves Boulder and form its own municipal utility. Voters passed supportive measures in 2010, 2011 and again in 2013.
- The five-year, renewing carbon tax (a tax on electricity use to support carbon-reduction efforts) was considered again by voters in 2012 and passed with a nearly 80% approval rating.
- Between 2010 and 2013, staff conducted extensive analysis of the feasibility of forming a municipal utility. Their recommendations to proceed were approved by Council in summer of 2013. A subsequent ballot measure to test community support was voted on in November of 2013 and passed with a 60% approval rating.

Tools

In Use or Under Development:

- Local carbon tax (in use)
- Energy advisor model for delivering energy efficiency (in use)
- Efficiency requirements for existing rental housing combined with incentives and effective program delivery (in use)
- Path to a net-zero building code (in development)
- Work on the operating principles and business model for 'the utility of the future,' that is focused on delivering energy services (deep energy efficiency, distributed generation and other "disruptive technologies") instead of on selling energy (in development)

Desired

- Coordinated strategy for joint EV - PV adoption, including financing mechanisms that enable broad-based community participation in renewable energy development, particularly low-to-moderate income households. (desired)
- Aggressive efficiency strategy for industrial/commercial buildings (desired)
- Fuel switching in the transportation sector (desired)

Useful informants for 80x50 planning

- Transportation: Nelson Nygaard and Fox Tuttle.
- Energy supply: Brendle Group
- Global Benchmarking: Stockholm Environmental Institute
- Mark Jacobson at Stanford re The Solutions Project
- RMI

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Engagement

Boulder is fortunate to be home to the University of Colorado, 14 federal research labs, and a vibrant entrepreneurial community working in clean energy and high tech. The city regularly convenes community working groups to tap local expertise as well as the passion of its active citizenry.

Boulder is forming a Climate Commitment Working Group made up of academic, business, community, and resource specialists who will review strategy documents. Once the Council provides feedback in July, there will be broad engagement in the community, leading up to adoption by Council in November.

Parallel to this effort, the city has begun convening gatherings of researchers from key federal labs (NCAR, USGS, NOAA, NREL), University of Colorado, and other government agencies to explore ways to more closely coordinate research activities with climate action strategy development (including adaptation).

A key focus of the community engagement efforts has been around the city's "energy future" work, including potential municipalization, with extensive outreach starting in 2010 to help articulate the community's energy goals, understand the role of energy source in emissions, and evaluate alternative "paths to the goal." This has included several rounds of intensive outreach that have included online communication and input; presentations to a wide range of community, neighborhood and business interest groups; "pop up" displays at local grocery stores and other highly visible locations; bus ads; conference calls; participation in panel discussions; guest speakers; op-ed columns in the local paper; a project newsletter; open houses; radio programs; and direct marketing. Local organizations with which the city regularly engages include the Boulder Chamber, Boulder Clean Energy Business Coalition, Boulder County Commissioners, Boulder Tomorrow, PLAN Boulder County, University of Colorado, Women in Wind Energy, New Era Colorado, League of Women Voters, Sierra Club, Boulder Climate Action Network, and numerous neighborhood associations and special interest groups. The city also regularly receives and responds to a high volume of letters and emails; televises council discussions of energy and climate-related discussions; has extensive public participation at council meetings; and engages with both local and national press through press releases and press briefings.

The City has a number of engagement processes under development.

- The City created a branding and marketing campaign to recruit and engage the larger community in the aggressive new climate goals Council endorsed. Before the campaign was launched, the city flooded, bringing to center stage the need to talk about resiliency and adaptation too. The campaign, which was to include both print and social media as well as active engagement of community opinion leaders and leading social organizations to launch a broad climate action initiative, was postponed to determine how best to integrate with

resilience related efforts and the next steps in the process toward creating a local electric utility.

- The City is about to launch a resiliency campaign, which it will try to integrate with the 80x50 campaign. (For example, a discussion about how to create energy resiliency may focus on the need for microgrid and local capacity, which feeds nicely into the mitigation goal of enabling local generation capacity.) A project idea is to create a program that allows residents to purchase EV vehicles through group purchase in a package with photovoltaics.

- The City is in the process of hiring a new energy efficiency strategist and program manager to lead the current effort toward developing an aggressive strategy for deep efficiency improvements in the commercial and industrial sectors. This effort will be developed in close collaboration with the business community.

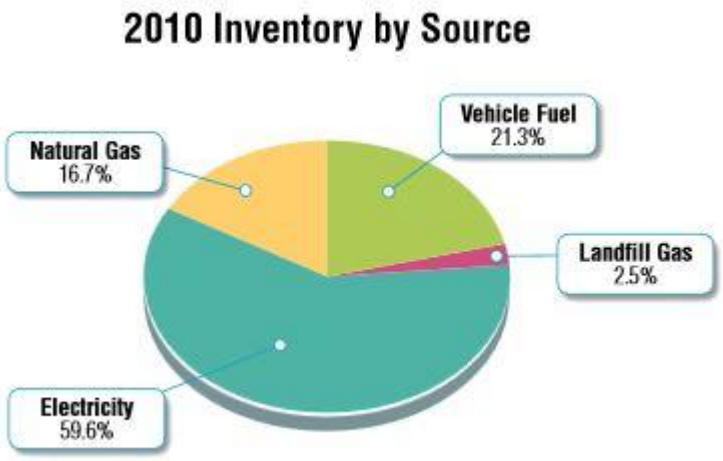
- The City is collaborating with the academic community/universities, which have their own carbon neutrality plans.

All sectors will be involved much more in 80x50 implementation.

GHG Inventory Scope and Baseline Analysis

The city conducted GHG emissions inventories in 2007, 2009, and 2010, and hopes to complete its next inventory by the end of 2014. Using State PUC rulings that enable utilities to restrict access to information on the largest users within each service territory, Xcel has not made full energy usage data available to the city since 2010, making it impossible for the city to do an accurate update of its GHG inventories. Through PUC dockets and efforts to negotiate with the company, Boulder is continuing to look for ways to be able to resume its inventory process. With the addition of its new GHG inventory tool and a variety of data streamlining efforts associated with its use, we hope to resume annual inventories by the end of 2014.

Included in the GHG Inventory & Targets	Emission Sources and Abatements That Are Not Included
• Road Transportation • Buildings (Electricity Use) • Buildings (Natural Gas Use) • Waste • Air Transportation • Heating and Backup Fuel • Residential • Commercial • Industrial Energy use	• Industrial emissions other than energy use • Agriculture emissions other than energy (e.g. methane production) • Natural system sequestration • Emissions from goods consumed in the city, but produced elsewhere (consumption GHGs) • Offsets •



For the next update, the City adopted the ICLEI community and local government protocols and all of their associated guidance related to emissions factors, emissions sectors for inclusion or exclusion and other guiding parameters. This will enable Boulder to more easily compare itself to other major cities as part of ongoing benchmarking. Three of the six focus areas for the Climate Commitment—Better Buildings, Ramp-up Renewables, and Travel wise—were recognized as representing over 95% of the city's emissions as measured according to the ICLEI protocol.

80 x 50 Planning Documents

- "Boulder Energy Future Memo and Resource Analysis" April 2013 analysis by staff that shows the potential levels of renewable resources that could be implemented under various scenarios.
- "Energy Localization Study – Electricity and Gatural Gas" 2011 analysis of options for localization of electricity and natural gas resources.
- "Climate Commitment final memo…" Goal Analysis and July 30th 2013 Council Memo on Goal Options.
- "Final Economic Sustainability Strategy Adopted By City Council" Implementation plan for the Economic Vitality strategy area of the City's Sustainability Plan.
- "Boulder Transportation GHG Analysis V10" Draft analysis of Boulder's transportation GHGs by travel sector including estimates of currently avoided GHG emissions resulting from existing programs.

Implementation Infrastructure and Support

An important lesson learned during Boulder's first ten years of climate action efforts was the propensity for climate action work to become "siloed" in ways that diminished overall organizational investment and participation in the initiative. As part of the reformation of the Climate Commitment, the organization reallocated a significant portion of a new Senior Environmental Planner position to focus on helping to coordinate climate action related efforts across all of the major departments that would be effected by these efforts. This staff person reports to both the Manager of the Comprehensive Planning Division as well as the Director and Deputy Directors of the Comprehensive Planning and Sustainability Department. He also works closely with an interdepartmental steering group—the Climate Action Coordination Committee—that meets weekly to review both climate action related efforts and the specific program related initiatives that are distributed across the organization. A larger city-wide climate team was about to be formed in late 2013 but was postponed when the Sept flood absorbed all available staff and resource capacity to coordinate response and recovery.

The city learned in late 2013 that it was selected to participate in the Rockefeller 100 Resilient Cities program, which brings with it a parallel city-wide organizing effort to create a resilience plan. Consequently, the city is currently working on an implementation plan that would more closely integrate climate action and climate resilience related efforts both internal to city operations and external with city residents, organizations and businesses.

In addition to the structures described elsewhere in the Baseline Report, the city is also an active participant in a wide range of consortiums and organizations that are intended to share both information and best practices as well as work on joint policy development. A partial list of these organizations includes:

- **Air Quality Control Commission (AQCC)2014 Natural Gas Rule Making Local Government Coalition:** Coalition of 8 jurisdictions aimed at proposing recommendations in the rule making process. Coalition includes: City and County of Denver, Adams County, Boulder County, La Plata County, Pitkin County, San Miguel County, City of Boulder and City of Fort Collins. The Coalitions comments were presented in the rule-making process in Feb 2014.

- **National Association of Clean Air Agencies (NACAA)- Steering Committee:** National Association of Clean Air Agencies (NACAA) represents air pollution control agencies in 45 states and territories and over 116 major metropolitan areas across the United States. The City is currently providing comments regarding New Source Performance Standards for greenhouse gas emissions from electric generating units. : http://www.4cleanair.org/

- **Applied Solutions- Founding Member and Chair of Technical Advisory Committee:** Applied Solutions is a nonprofit organization working with local governments to help build a clean economy by undertaking clean energy and water projects that promote local job creation, energy savings, economic development and

greater self-reliance strengthened by the integration of cleaner energy sources and efficiency measures.: http://www.appliedsolutions.org/site/1/Home

- **Colorado Climate Network- Steering Committee**: The mission of the Colorado Climate Network is to support efforts by local governments and allied organizations in Colorado to reduce heat-trapping gases and to adapt to climate change – whether those efforts are styled as climate, sustainability, energy, or adaptation programs. Launched by the Rocky Mountain Climate Organization and local community partners in May 2009, the Network helps its members develop and implement those programs, learn of funding and other resources, and interact more productively with other local and state programs in Colorado. For more information about the Colorado Climate Network and the Rocky Mountain Climate Organization (RMCO): http://www.coclimatenetwork.org/

- **Urban Smart City -Advisory Group:** The iURBAN tool will address increasing market demands for cheaper, cleaner energy services. It is being designed with the direct involvement of end users - local residents, energy companies and public administration. : http://www.iurban-project.eu/

- **Boulder Sustainability Alliance:** Regional agencies passed a Resolution in Support of Enhancing Collaborative Efforts Between the Boulder Valley School District, the University of Colorado at Boulder, Boulder County and the City of Boulder to Progress Toward Environmental Sustainability. The group continues to meet on a regular basis to discuss issues and strategies that are cross-cutting and lead to continued collaboration.

- **Colorado Clean Energy Cluster Colorado Clean Energy Cluster**- Founded in 2006, CCEC is focused on innovative and entrepreneurial ways to grow the clean energy sector through actionable projects and initiatives that directly benefit Colorado clean energy companies. CCEC projects positively impact efficiencies in energy production and consumption, and associated sustainability, when compared to continuation of existing practices in meeting the energy needs of Colorado and the world. http://www.coloradocleanenergy.com/

The city is also in active discussions with the EPA and DOE to discuss possible pilot projects related to Boulder's efforts to create a new energy services model.

Important Contextual Factors and Variations

Among the key contextual features that currently influence Boulder's capacities to implement deep GHG reduction strategies are the following:

Home Rule Authority – Based on the state constitution, Boulder does have the authority to establish and run local utilities including sewer, water, gas and electric. This authority has made it possible for

the city to pursue municipalization of its utility. This also gives the city the authority to establish its own building codes. In 2013, the city established a building code standards process that is targeting 2030 to complete code cycle upgrades requiring all new buildings to meet net zero building standards. The city is also contemplating implementation of commercial energy code requirements that would initially include rating and reporting and may eventually include specific energy efficiency standards.

State Utility Regulation – Despite the authorities granted in the state constitution, the State PUC has ruled that it has jurisdiction over a number of key provisions related to the city's proposed utility service plan. Depending on the outcome of discussions and proceedings on this issue, Boulder may or may not be able to successfully form its own utility.

Utility management and infrastructure – A key factor influencing Boulder's capacity to implement an aggressive implementation of both energy efficiency and renewable energy development strategies are the management practices and existing utility infrastructure configurations. Currently Xcel energy has clearly signaled that it intends to request PUC support for phasing out significant support to local generation development e.g. roof top solar and instead direct rate payer investments to large off-site renewable generation development. This also includes not investing in the critical local utility distribution infrastructure that is essential to enable large scale integration of local generation assets.

Innovative financing mechanisms – Another factor influencing local renewable energy development is the lack of creative financing mechanisms that make solar energy accessible to low-to-middle income residents.

Mayoral Power Scale

	Own/Operate	Set/Enforce Policies	Budgetary Control	Set Vision
Private Buildings		Strong Power. Can pass building codes.		
Public Buildings		Strong Power	Strong Power	Strong Power
Energy Supply	Own 40Mw of power generation/200 mW load			
Finance & Economy		Strong Power	Strong Power	
Public Transit	Denver Regional Transportation District operates community transit network funded by the City to supplement services.	Partial power to make decisions about lines and level of service.	Partial Power	

City Roads			Strong Power	
Urban Land Use			Strong Power	
Waste		Strong Power	Partial Power	Strong Power
Water	Own utility		Strong Power	

80 x 50 Roadmap Details

As noted above, the preliminary list of strategies being considered for implementation in the three primary energy focus areas are included in Attachment I.

Work also is also underway to develop strategic plans in the other three Climate Commitment focus areas—resilience, economic development and policy reform. These are listed briefly below.

Resilience – As part of the Rockefeller 100 Resilient Cities process, Boulder is launching its resilience planning process at a staff and key partners workshop on April 28th. This will initiate a 12-18 months process of integrating the wide range of existing resilience efforts already underway as well as identifying other key priorities. The inclusion of resilience as a core focus area of the Climate Commitment is part of the effort to closely coordinate both mitigation and resilience/adaptation actions.

Economic Development – Boulder is currently exploring membership in the Colorado Clean Energy Cluster, a member organization of the larger International Cleantech Network. The Cluster has proposed assisting Boulder in developing and implementing a comprehensive business development initiative to grow and coordinate Boulder's clean tech sector, particularly to focus on new energy efficiency and renewable energy development opportunities. Boulder is co-hosting an annual conference focused on these topics and looks forward to participating in both national and international networks intended to accelerate innovation in these sectors.

Policy reform – This is a new focus area being proposed for the climate commitment. Although Boulder has engaged in various policy related efforts in the past, it has not yet created a coordinated policy reform agenda organized to address the key issues and barriers that both it and other cities are facing.

Funding Priorities—Given the significant resource requirements of attempting to form its own municipal utility, Boulder is currently experiencing substantial resource constraints in developing and launching any additional programs or initiatives. A number of key analyses are currently needed as part of both the utility resource planning and the larger Climate Commitment strategy development. These include a comprehensive and detailed assessment of local generation capabilities, infrastructure enhancement needs, and high leverage first stage pilot project opportunities.

Next Steps

- The Transportation Department is updating the Transportation Master Plan, considering adding a new target for GHG emissions reductions. It is exploring meeting new goals through a 20% reduction in VMT by 2050 with the remainder coming from electrification of the vehicle fleet.
- The Energy Team working on the municipalization strategy is involved in energy resource planning. The goal of establishing a municipal utility is to be able to pursue a much larger proportion of energy from renewable energy, perhaps 60% renewable energy within 5 years while meeting Xcel's rate structure and reliability.
- Another early target in addition to the Local Energy Action Plan and Transportation Master Plan, is the Zero Waste master Plan.
- The city is working with Austin-based Pecan Street Research Institute, using technology from a Boulder firm, to develop "behind the meter" or "customer-side" energy use information from Boulder businesses that will help them develop better program and service options.
- The City is actively considering joining the Colorado Clean Energy Cluster, which can help with development of the renewable energy business sector. The International Cleantech Network (ICN) located in Copenhagen as a part of Copenhagen Cleantech Cluster has assisted Colorado Clean Energy Cluster in finding an expert in climate strategy planning for cities. The City also is working with Loveland and Fort Collins on annual clean energy conference (Triple Helix Model)

Areas of Boulder Best Practice for Sharing With Other Cities

- Residential EE Package (Energy Smart, Smart Regs, advisor model)
    - Energy Smart program
    - Energy advisor model for delivering energy efficiency
    - Efficiency requirements for existing rental housing combined with incentives and effective program delivery (SmartRegs)
- New building code path to net zero by 2030
- Process for integrating climate action into all city planning
- Through extensive energy performance contracts, the city was able to achieve a 25% reduction below its 2008 emissions by 2011.
- Local Carbon Tax approved twice by voters
- Work on the operating principles and business model for 'the utility of the future,' that is focused on delivering energy services (deep energy efficiency, distributed generation and other "disruptive technologies") instead of on selling energy (in development)
- Package of tools for downtown transportation, achieving a 50% mode split. Through free bus passes, parking management strategy, etc.
- High solar per capita penetration.

- 33 mw owned hydro power and 2MW equivalent solar power.
- Analysis of expansion of biogas facility to start optimizing other waste resources in the community
- Zero Waste regional partnership/infrastructure development
- Boulder's extensive use of citizen working groups to provide technical expertise, ground truthing, and community support. For example, the recent municipalization process constituted 5 separate major working groups, each of which had between 15-30 participants.

Areas Where Boulder is Most Interested in Learning From or Collaborating with Network Members

Learning from peers about solutions

- Proven paths to achieve a high level of fuel source switching in electrical generation, heating/cooling and transportation, including synergistic approaches between different sectors (e.g., coordinated PV/EV strategies).
- Localized energy generation and management models, including but not limited to distributed generation, net metering, aggressive energy efficiency, groundsource heating/cooling, intelligent grid solutions, and district energy.
- Industrial and commercial building energy reduction/management strategies, going beyond energy use monitoring and reporting and voluntary compliance strategies.
- Aggressive strategies for EV and alt-fuel vehicle adoption in the marketplace and creation of a local charging station infrastructure, implemented in balance with a comprehensive mobility strategy that invests in biking, walking and transit.
- Building code and incentive-based strategies to implement net-zero efficiency requirements in new construction and retrofits.
- Models for triple-helix partnerships (government / businesses / research)

Co-developing solutions with peers

- A similar list of key issues to that above, but expanded to include opportunities for testing/piloting new solutions or strategies among member cities in a way that builds a shared body of knowledge more quickly (e.g., through coordinated research approaches that can test a single solution or approach in multiple contexts at the same time, or alternative approaches in similar contexts).

Advocating with peers for outside action

- National and international policies and practices play a key role in supporting (or hindering) local level action. I would not want to replicate the work other networks and organizations are doing (though we could consider how best to partner and support their efforts), but I do think there is an opportunity to draw upon the leadership and case examples from the network members to highlight the economic, social and environmental benefits of aggressive carbon reduction strategies (and to coordinate lobbying of member-city businesses, residents and other partners).

Specific cities most interested in learning from: All of them (!) -- but what is particularly attractive is the opportunity to learn from European cities that appear to have been able to pursue more aggressive renewable energy strategies due to strong federal/EU support (policies and funding); high energy costs; and political/social support. While some things obviously won't translate, some policy approaches, business models, partnership models and technical solutions/strategies would be particularly helpful.

Network Design

The top benefits of the network would be:

- Deep peer-to-peer learning regarding how other leading-edge cities are approaching and structuring carbon neutral plans and strategies, including how they are framing their long-term goals and near-term targets; methods of analysis; mechanisms for monitoring and reporting; specific carbon-reduction strategies (technical, behavioral, political, regulatory, economic incentives, etc.); community engagement models/processes; partnerships (city role, other government agencies, private sector, residences/neighborhoods, etc.); specific policy / regulatory mechanisms and language; and organizational structure / program delivery models.

- Sharing of lessons learned from activities and initiatives undertaken in Boulder to design and implement strategies (and their various components, as listed in the first bullet) to achieve carbon neutrality. (This goes hand-in-hand with the deep peer-to-peer learning, but makes explicit that it's a multi-way path and shared commitment.)
- Collaborative problem solving, having an "on-call brain trust" to draw upon when faced with significant questions and challenges related to the design and implementation of aggressive carbon reduction strategies (across any of the categories listed in the first bullet).

- Providing leadership and communicating best-practice approaches for other cities that may face more significant political obstacles to adopting or pursuing aggressive carbon-neutrality goals and strategies, with emphasis on communicating and demonstrating the inherent economic opportunities and benefits.

- Coordinated lobbying to advance national and international policies and agreements necessary to support local-level action to achieve deep carbon reductions and carbon neutrality.

- City-to-city networking and challenges--providing an opportunity for political leaders, businesses, residents and other partners in each city to learn from each other and engage in friendly challenges aimed at "pushing the envelope" in leading-edge communities. (I recognize this may be beyond the scope, but would be nice to think of some way the network's activities and benefits extend beyond the staff/professional level, becoming a mechanism for promoting education and action more broadly in the participating communities.)

Network structures that could provide value:

- Engaging staff experts

- Helping to staff/lead/support working groups on specific topics: Strongly support creation of working groups that engage staff in member cities that are actively engaged in designing and implementing approaches or solutions to shared (priority) challenges. Would be great to structure the working groups around the creation of specific outcomes (rather than a more general/unstructured process of sharing).
- Creating peer-to-peer deep learning opportunities-: time-limited staff exchanges, in which a staff expert from one jurisdiction might be available to spend a week or two weeks in another member jurisdiction (with other member key staff invited to also participate and learn) to essentially serve as a consultant for an intensive period of time to achieve specific program/policy/strategy design or evaluation outcomes.
- Providing in-depth education, problem-solving or shared learning sessions at network gatherings or other venues.
- Engaging outside experts: Similar to the list under “Engaging staff experts” -- as working group support; in-depth short-term shared consultancy; and/or a targeted resource at network gatherings.
- External communications: Initially, would be good to focus communications on businesses/residents in the member cities themselves, to learn about how their city governments are engaged in a learning network and providing opportunities for them to participate in the shared learning process. Secondly, communicate key learnings and best practices from the network with other cities that might find the information motivating or helpful in their local work. Third, target specific communications to relevant higher-level policymakers (national, international) to provide a common voice for leading-edge cities in support of desired policy outcomes.

Appendix I. Roadmaps by Key Sector

Energy Source Replacement Roadmap

Key Measures	Immediate (2014)	Near-Term (2015-2020)	Mid-Term (2021-2035)	Long-Term (2036-2050)

-Site/Local Resources	• Local generation potential analysis • Solar soft cost reductions • Revise solar grant program	• Solar Friendly Communities • Building and zoning code updates • Solar garden development* • CHP Program* • Storage* • Behind-the-meter microgrids • Value solar/explore local solar tariffs* • Demand response* • Enhance solar mapping • Enhance solar monitoring* • Ubiquitous electric vehicle charging areas (renewable sources) • New financing offerings	• Further enhance building codes – integrated storage, BIPV • Geothermal programs* • Solar thermal programs (subject to gas price increases)* • Vehicle-to-grid programs* • Continue to enhance grid intelligence to facilitate integration of distributed renewable energy* • Customer energy transactions: microgrids, shared backup, transactive energy* • On-bill financing for on-site renewables* • Virtual net metering for customer-to-customer solar funding*	• Cover rooftops with solar • Living buildings

Off-Site/Large-scale Resources	• Best practices related to natural gas extraction in communities	• Community green power purchasing through CCA or Windsource-type offering* • Develop integrated resource planning process that appropriately values renewable resources* • Sourcing natural gas that meets BMPs for human and environmental health*	• Biogas programs • Enhance or expand hydroelectric facilities • Battery farms	• I think it strains credibility to include right now, but space-based solar and wind power….

Energy Efficiency GHG Reduction Roadmap*Home energy management – a full package of energy efficiency, renewable energy, deep energy retrofit measures and technologies.

Key Measures	Immediate (2014)	Near Term (2015--2020)	Mid Term (2021--2035)	Long Term (2036--2050)

Key Measures

	Strategy Focus By Phase			
	Focus residential energy programs on SmartRegs compliance and define gaps in commercial and industrial efficiency initiatives	Implement a mandatory commercial building rating and reporting program and expand residential and commercial energy monitoring services	Significantly increase the number of comprehensive, durable, performance-based residential and commercial building upgrades through a robust, sustainable industry.	Create zero emissions pathways for residential and commercial building stocks that provide economic opportunities.
Residential	*Develop a short-term and long-term strategy for SmartRegs compliance to 2019. *Continue EnergySmart services in partnership with Boulder County	*Identify outstanding enforcement issues unresolved for SmartRegs and seek council direction. *Explore & support market driven strategies & industry development for comprehensive home energy management*	*Implement net zero energy codes for new and remodel construction projects. *Implement retrofit and energy off-set requirement for existing residential buildings that is date specific. *Support neighborhood scale EE & RE service contracts	*Support neighborhood scale microgrids

Commercial	*Relaunch the expanded PACE program that is a full service business sustainability program *Integrate a voluntary rating and reporting program into the PACE umbrella program	*Identify gaps and develop next generation energy efficiency/renewable energy programs & incentives to drive the market. *Improve access to energy usage information * Assist in market transformation for building automation systems & Smartgrid technologies	*Implement net zero energy codes for new and remodel construction projects. *Implement retrofit and energy offset requirements for existing C/I buildings and operations that is date specific. *Support comprehensive financing options for deep energy retrofits. *Support EcoDistrict development	*Support business district scale microgrids
Industrial	*Define and quantify Industrial energy use in Boulder	*Assist and support existing programs & market to implement industrial energy efficiency and combined heat and power (CHP) projects for large users.	*Support the cost effective implementation of CHP projects for large users.	*Require CHP projects that produce more energy than industrial facilities use by specific date.

Transportation Strategies Roadmap

	Immediate (2014)	Near Term (2015--2020)	Mid Term (2021--2035)	Long Term (2036--2050)
Key Measures	**Complete Transportation Master Plan and related planning initiatives and pilot project design efforts**	**Implement TMP action items. Initiate pilot projects in fuel switching. Identify additional TDM options. Phase in electric charging infrastructure**	**Expand multi-modal options. Invest substantially in transit and alternative vehicle infrastructure including alternative fuel transit fleet.**	**Complete the build out of a zero emissions urban transportation system**
Transit	• Select preferred TMP transit strategy •			
Multi-modal travel	• Conduct Bike/Walk Summit & develop recommendations • Publish Community-wide EcoPass study & propose option for implementation			

Transport Demand Mgmt	• Evaluate establishment of additional parking districts •			
Fuels and Technologies	• Deploy pilot charging stations. • Conduct City fleet assessment for EV conversion • Develop employee EV commute pilot project for city employees	• Plan electrification infrastructure across city. • Implement EV adoption programs • Streamline permitting procedures for EV infrastructure • Convert 30% of city fleet to EVs		
Land Planning	• Complete 20 minute neighborhood analysis • Initiate “Envision Arapahoe” planning process including GHG assessment			